Claims 1-12 are presently pending in this application, Claims 1 and 2 having been amended, and Claims 5-12 having been newly added by the present amendment.

In the outstanding Office Action, the abstract of the disclosure was objected to for informalities; Claims 1-4 were rejected under 35 U.S.C. §112, second paragraph, for being indefinite; and Claims 1-4 were rejected under 35 U.S.C. §102(b) as being anticipated by Jullian et al. (U.S. Patent 5,863,315).

The specification has been amended for formality. In particular, the specification as submitted November 2, 2002 as a substitute specification has been amended to add appropriate headings and description of drawings therefor.

In response to the objection to the abstract of the disclosure, it is respectfully submitted that an abstract of the disclosure in less than 150 words has been submitted on December 14. However, submitted herewith is a new abstract of disclosure which is also less than 150 words and believed to be more consistent with Claim 1 amended herein.

With regard to the rejection under 35 U.S.C. §112, second paragraph, Claims 1 and 2 have been amended to clarify the subject matter recited therein. Thus, Claims 1-4 are believed to be in compliance with the requirements of the statute. Also, these claim amendments are believed to be merely cosmetic and thus is not believed to narrow the scopes of the original claims. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work in a joint effort to derive mutually satisfactory claim language.

Also, Claims 5-12 have been newly added herein. New Claims 5-12 find clear support in the original specification, claims and drawings. For example, Claims 5-8 and 12 are believed to be supported by Claim 1 and Figures 1-4, and Claims 9-11 are supported similar to Claims 2-4. Hence, no new matter is believed to be added thereby.

Briefly recapitulating, Claim 1 of the present invention is directed to a process for separating mixtures of hydrocarbon isomers in gas phase on molecular sieves, including providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence, feeding the mixtures of hydrocarbon isomers to at least one of the columns functioning as the primary adsorption device such that isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers are adsorbed, feeding an effluent of the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the primary adsorption device to at least one of the columns functioning as the secondary adsorption device such that remaining of the isomers with a greater selectivity towards the molecular sieves are adsorbed, discharging isomers with a lower selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the secondary adsorption device and a desorbing agent remaining therein, feeding a desorbing agent to at least one of the columns functioning as the desorption device, discharging isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers and the desorbing agent in the at least one of the columns functioning as the desorption device, feeding the isomers with a lower selectivity towards the molecular sieves and the desorbing agent discharged from the at least one column functioning as the secondary adsorption device to a first distillation unit configured to recover the desorbing agent for recycling for the at least one column functioning as the desorption device, and feeding the isomers with a greater selectivity towards the molecular sieves and the desorbing agent discharged from the at least one of the columns functioning as the desorption device to a second distillation unit configured to recover the desorbing agent for recycling for the at

least one of the columns functioning as the desorption device. By providing such a plurality of columns, only three phases are required to complete a cycle of the columns in the process while the adsorption is carried out in two adsorption devices connected in series, one being the primary adsorption device to be brought to saturation and the other being the secondary adsorption device serving as a control bed. That is, at the end of the adsorption phase, when the mass transfer zone is saturated and moves to the secondary adsorption device, the primary adsorption device is submitted to the desorption phase, while the secondary adsorption device becomes the primary adsorption column in the following phase. As a result, the process according to Claim 1 provides a simple system while the adsorption yield of the extracted product is significantly increased. In addition, in a complete cycle, the feedstock of hydrocarbon mixture and desorbent can be always fed to the columns and also outgoing streams of refined and extracted products can be always present. Because a complete cycle of adsorption and desorption can be carried out in three phases in the same duration, the process according to the present invention can be carried out in an almost continuous sequence of the columns.

The outstanding Office Action asserts that Jullian et al. disclose a process as recited in Claim 1. Nevertheless, Jullian et al. do not teach "providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence" as recited in amended Claim 1. On the other hand, Jullian et al. disclose a process in which only one column carries out the adsorption which can end when or before the column is saturated and lasts three subsequent phases. During the entire adsorption phase, the outgoing stream of the column is recovered as refined product. Because of the presence of a non-negligible mass transfer zone and without a control bed in (1)

downstream, if the saturation of the column is reached, the purity of the refined product and the recovery are reduced, and if a mass transfer zone is limited in the column, a product having a high purity can be obtained but with a lower recovery. Further, according to the Jullian et al. process, the nine phases including first pressurizing, depressurizing and second pressurizing phases, while the process recited in Claim 1 does not use the pressure changes for adsorption and desorption. Furthermore, the desorbent is fed only to three phases out of the nine phases, the extract stream is present only in three phases, and only three out of the nine phases may have the same duration in the Jullian et al. process. Therefore, the subject matter recited in Claim 1 is believed to be distinguishable from Jullian et al., and thus is not anticipated thereby. (2)

Furthermore, because Jullian et al. do not discloses the providing step as recited in amended Claim 1, the teachings of this applied references are not believed to render the subject matter recited in Claim 1 obvious.

Likewise, independent Claim 6 includes subject matter substantially similar to what is recited in Claim 1 to the extent discussed above. Thus, Claim 6 is also distinguishable from Jullian et al.

For the foregoing reasons, Claims 1 and 6 are believed to be allowable. Furthermore, since Claims 2-5 and 7-12 ultimately depend from either Claim 1 or 6, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 2-5 and 7-12 are believed to be allowable as well.

Applicants also wish to point out that the process as recited in Claim 2 of the present invention requires working temperature and pressure which are significantly lower. In fact, treating the same feedstock, it is possible to work at pressure very close to the atmospheric pressure (1.1 bar in Examples 1-4 as shown at page 6, line 21 of the specification) and at

temperature of 20-30°C higher than the boiling temperature while maintaining the same separation performance. On the other hand, the Jullian et al. process discloses working at 17.7-17.4 bar at 130-150°C higher than boiling temperature.

In view of the amendments and discussions presented above, Applicants respectfully submit that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Gregory J. Maier
Registration No. 25,599
Robert T. Pous
Registration No. 29,099
Attorneys of Record

22850

Tel: (703) 413-3000
Fax: (703) 413-2220
GJM/RTP/AY:fmw
I:\ATTY\AKY\21s\210183\ame.wpd

Marked-Up Copy
Serial No: **09/886,994**
Amendment Filed on:
January 27, 2003

IN THE SPECIFICATION

Page 1, one line above the existing title, please insert the following:

--TITLE OF THE INVENTION--

Page 1, before the paragraph [0001], insert the following:

--BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION--

Page 1, before the paragraph [0002], insert the following:

--DISCUSSION OF THE BACKGROUND--

Page 2, before the paragraph [0010], insert the following:

--SUMMARY OF THE INVENTION--

Page 4, before the paragraph [0020], insert the following:

--BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 is a schematic diagram of Phase 1 of an embodiment according to the present invention;

Figure 2 is a schematic diagram of Phase 2 of the embodiment shown in Figure 1;

Figure 3 is a schematic diagram of Phase 3 of the embodiment shown in Figures 1 and 2; and

Figure 4 is a schematic block diagram showing another embodiment according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS--

IN THE CLAIMS

Please amend Claims 1 and 2, and add new Claims 5-12 as follows:

--1. (Amended) A process for separating mixtures of hydrocarbon isomers in gas phase on molecular sieves, [characterized in that it comprises] comprising the [following] steps of:

providing a plurality of columns each including molecular sieves and configured to function alternately such that the columns are designated to function from a secondary adsorption device, to a primary adsorption device, and to a desorption device in sequence;

[(a)] feeding the mixtures of hydrocarbon isomers to [a column, or several columns, having the function of] at least one of the columns functioning as the primary adsorption [column, wherein part of the isomers] device such that isomers with a greater selectivity towards the molecular sieves[,] in the mixtures of hydrocarbon isomers are adsorbed;

[(b)] feeding [the] an effluent of the mixtures of hydrocarbon isomers from the at

least one of the columns functioning as the primary adsorption [column (s)] device to [a column, or several columns, having the function of] at least one of the columns functioning as the secondary adsorption [column, wherein the] device such that remaining [part] of the isomers with a greater selectivity towards the molecular sieves[,] are adsorbed[, and from which a stream is discharged containing the isomers with a lower selectivity towards the molecular sieves, and the desorbing agent already present in the column];

discharging isomers with a lower selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers from the at least one of the columns functioning as the secondary adsorption device and a desorbing agent remaining therein;

[(c)] feeding [the] a desorbing agent to [a column (s) having the function of] at least one of the columns functioning as the desorption [column, from which a stream is discharged containing the isomers with a greater selectivity towards the molecular sieves, and the desorbing agent itself] device;

discharging isomers with a greater selectivity towards the molecular sieves in the mixtures of hydrocarbon isomers and the desorbing agent in the at least one of the columns functioning as the desorption device;

[(d)] feeding [the stream containing] the isomers with a lower selectivity towards the molecular sieves and the desorbing agent[, leaving] discharged from the [column (s) having the function of] at least one column functioning as the secondary adsorption [column,] device to a first distillation unit [for the recovery of] configured to recover the desorbing agent [to be recycled to] for recycling for the [column (s) having a] at least one column functioning as the desorption [function] device; and

[(e)] feeding [the stream containing] the isomers with a greater selectivity towards the molecular sieves[,] and the desorbing agent[, leaving] discharged from the [column (s)

having the function of] <u>at least one of the columns functioning as the</u> desorption [column,] <u>device</u> to [another] <u>a second</u> distillation unit [for the recovery of] <u>configured to recover</u> the desorbing agent [to be recycled to] <u>for recycling for</u> the [column (s) having a] <u>at least one of the columns functioning as the</u> desorption [function, steps (a), (b) and (c) being effected by means of three phases and a number of three or a multiple of three columns having fixed molecular sieve beds, so that from one phase to another, these columns pass alternatively in sequence from secondary adsorption column functions, to primary adsorption column functions, to desorption column functions] <u>device</u>.

2. (Amended) The process according to claim 1, wherein the [adsorptions are carried] <u>columns are configured to carry</u> out at a temperature ranging from 20 to 180°C and at a pressure ranging from 1 to 10 bars <u>when functioning as the primary and secondary adsorption devices</u>.

5.-12. (New)--

IN THE ABSTRACT

Please delete the abstract of the disclosure submitted December 14, 2002, and substitute therefor a new text as follows:

[A process for separating hydrocarbon isomers in gas phase on molecular sieves, including feeding mixtures of hydrocarbon isomers to a primary adsorption column configured to adsorb isomers with a greater selectivity towards the molecular sieves, feeding effluent from the primary adsorption column to a secondary adsorption column configured to adsorb remaining isomers with a greater selectivity towards the molecular sieves and discharge a stream containing isomers with a lower selectivity towards the molecular sieves, feeding desorbing agent to a desorption column configured to discharge a stream containing

isomers with a greater selectivity towards the molecular sieves and the desorbing agent, feeding the stream from the secondary adsorption column to a distillation unit configured to recover the desorbing agent for recycling to the desorption column, feeding the stream from the desorption column to another distillation unit configured to recover the desorbing agent for recycling to the desorption column.]

--A process for separating mixtures of hydrocarbon isomers on molecular sieves, including providing columns which include molecular sieves and function alternately as secondary adsorption, primary adsorption, and desorption devices, feeding the mixtures of hydrocarbon isomers to a column functioning as the primary adsorption device for adsorbing isomers with greater selectivity towards the molecular sieves, feeding effluent of the mixtures from the column functioning as the primary adsorption device to a column functioning as the secondary adsorption device for adsorbing remaining isomers with greater selectivity, discharging isomers with a lower selectivity from the column functioning as the secondary adsorption device and a desorbing agent therein, feeding a desorbing agent to the column functioning as the desorption device, discharging isomers with a greater selectivity towards the molecular sieves and the desorbing agent in the column functioning as the desorption device.--